

AMENDMENTS TO THE SPECIFICATION

Please replace the paragraphs starting with the title on page 1, line 1 and ending on page 2, line 33 with the following:

CONTROL APPARATUS AND ENGINE CONTROL METHOD OF ENGINEField of The Invention BACKGROUND

The present invention relates to a technique for setting a cylinder discrimination value for discriminating a cylinder at a reference piston position and controlling fuel injection or ignition for each cylinder based on the cylinder discrimination value, in an internal combustion engine.

Related Art of The Invention

Japanese Unexamined Patent Publication No. 11-257148 discloses a method of setting a cylinder discrimination value based on a cylinder discriminating signal output from a cam sensor and controlling fuel injection and ignition for each cylinder based on the cylinder discrimination value.

The cylinder discrimination value is sequentially changed over for each stroke phase difference between cylinders in accordance with ignition order. Therefore, even if the cam sensor is failed, it is possible to estimate a present value from a previous value, following a normal time. As a result, Then, by storing a cylinder discrimination value of immediately before an engine stop, it is possible to start the engine by a control for each cylinder even if the cam sensor ~~is failed.~~ has failed.

~~However, Unfortunately,~~ if the engine is rotated in reverse immediately before the engine ~~stop and stops~~ (and it becomes necessary to update the timing of cylinder discrimination value due to the reverse ~~rotation,~~ rotation), the cylinder discrimination value is improperly updated to a value corresponding to a cylinder of next ignition order in a forward rotation. Further, in the case where cranking is stopped before completion of engine start, the engine is rotated in ~~reverse and also reverse,~~ and fuel is burned during the reverse rotation, ~~resulting in that~~ the engine is further rotated. Thus, if the fuel is burned during the reverse rotation resulting in ~~that the engine is~~ the engine being excessively rotated, the cylinder discrimination value at the engine stop cannot be judged accurately even if the reverse rotation of the engine is detected.

Summary of the Invention SUMMARY

The present invention has been achieved in view of the above problems and has an object to enable a control for each cylinder from an engine start while avoiding an erroneous control based on an erroneous cylinder discrimination result, when a cam-sensor is sensor has failed.

~~In order to~~ To achieve the above object, the present invention is constituted so that, when an engine is rotated in reverse ~~and also~~ and fuel is burned in the engine during the reverse rotation, a control for each cylinder based on a cylinder discrimination value estimated based on a previous cylinder discrimination value, is prohibited. ~~The other~~ This and other objects and features of this invention will become ~~understood~~ apparent from the following description with accompanying drawings.

~~Brief Explanation of the Drawings~~ BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a view showing a system structure of an engine in an embodiment of the present invention.

Fig. 2 is a time chart showing output characteristics of a crank angle sensor and a cam sensor in the embodiment of the present ~~invention.~~ invention shown in Figure 1.

Fig. 3 is a flowchart showing a cylinder discrimination process in the embodiment of the present ~~invention.~~ invention shown in Figure 1.

Fig. 4 is a flowchart showing a cylinder discrimination process in the embodiment of the present ~~invention.~~ invention shown in Figure 1.

Fig. 5 is a flowchart showing a cylinder discrimination process in the embodiment of the present ~~invention.~~ invention shown in Figure 1.

Fig. 6 is a flowchart showing a burning judgment process during a reverse rotation in the embodiment of the present ~~invention.~~ invention shown in Figure 1.

Fig. 7 is a flowchart showing a counting process of cylinder discriminating signal in the embodiment of the present ~~invention.~~ invention shown in Figure 1.

Fig. 8 is a flowchart showing a detection of reverse rotation in the embodiment of the present ~~invention.~~ invention shown in Figure 1.

Fig. 9 is a flowchart showing a detection of reverse rotation in the embodiment of the present ~~invention.~~ invention shown in Figure 1.

Fig. 10 is a graph showing a correlation between a water temperature and a threshold to be used for ~~burning~~ burning judgment during the reverse rotation in the embodiment of the present ~~invention.~~ invention shown in Figure 1.

~~Detailed Description of the Embodiment~~ DETAILED DESCRIPTION

Please replace the paragraph on page 3, lines 25-26 with the following:

ECU 113 performs a switching control of each power transistor, to control independently the ignition timing of each cylinder.

Please replace the paragraph on page 5, lines 26-27 with the following:

Thereby, it is judged whether or not the most newly measured period TPOS is a result of measuring the portion of no position signal POS.

Please replace the paragraph on page 7, lines 9-11 with the following:

At step S12, cylinder discrimination value CYLCAM is set based on a value of counted value ~~CANCNT~~, CAMCNT, which is counted up at step S51 in a flowchart of Fig. 7 at each time when cylinder discriminating signal PHASE is generated.

Please replace the paragraph on page 8, lines 3-4 with the following:

Backup cylinder discrimination value CYLBUP is RAM data stored even ~~during~~ while a key switch is OFF.

Please replace the paragraph on page 10, lines 27-28 with the following:

Note, it is preferable that backup cylinder discrimination value CYLBUP is set to a value retarded to an actual value, even if the judgment of the reverse rotation ~~is failed~~, has failed.

Please replace the paragraphs on page 16, lines 2-8 with the follow:

While only selected embodiments have been chosen to illustrate the present invention, it will be apparent to those skilled in the art from this disclosure that various ~~change and modification~~ changes and modifications can be made herein without departing from the scope of the invention as defined in the appended claims.

Furthermore, the foregoing ~~descriptions~~ description of the embodiments according to the present invention are provided for illustration only, and not for the purpose of limiting the invention as defined by the appended claims and their equivalents.